

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 832 494 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

10.11.1999 Bulletin 1999/45

(21) Application number: **96920741.4**

(22) Date of filing: **12.06.1996**

(51) Int Cl.⁶: **H01H 11/00**

(86) International application number:
PCT/DK96/00257

(87) International publication number:
WO 96/42097 (27.12.1996 Gazette 1996/56)

(54) **A METHOD OF PRODUCING AN ELECTRICAL SWITCH**

VERFAHREN ZUR HERSTELLUNG EINES ELEKTRISCHEN SCHALTERS

PROCEDE DE PRODUCTION D'UN INTERRUPTEUR ELECTRIQUE

(84) Designated Contracting States:
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE**

Designated Extension States:
AL LT LV SI

(30) Priority: **13.06.1995 DK 67595**

(43) Date of publication of application:
01.04.1998 Bulletin 1998/14

(60) Divisional application: **98121319.2 / 0 907 194**

(73) Proprietor: **MEC A/S**
2750 Ballerup (DK)

(72) Inventors:

- **ENOCH, Claus**
DK-4600 Koge (DK)
- **FLEMMING, Jacobsen**
DK-2730 Herlev (DK)

(74) Representative:

Plougmann, Vingtoft & Partners A/S
Sankt Annae Plads 11,
P.O. Box 3007
1021 Copenhagen K (DK)

(56) References cited:

EP-A- 0 030 473	EP-A- 0 155 390
EP-A- 0 411 331	DE-A- 2 505 120
FR-A- 2 518 355	GB-A- 2 280 785

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 0 832 494 B1

Description

[0001] The present invention relates to a method of producing an electrical switch comprising a housing at least partially enclosing switching means for cooperating with a set of at least two metallic terminals, each terminal having an exterior portion outside the housing and an interior portion inside the housing.

[0002] In relation to switches of this type it is extremely important to reduce the manufacturing costs. Any factor that increases the number of switches produced in a given period of time with the same personnel, factory space and discrete units of production equipment is essential for the competitiveness of the finished switch in the marketplace.

[0003] It is therefore an object of the present invention to provide a method of producing such switches in which such an increased production capacity is obtained as compared with prior art methods.

[0004] A method for producing keyboard switches according to the preamble of claim 1 is known from European Patent No. 0 329 968 in which a single row of sets of metallic terminals is punched out of a strip of the base metal of the terminals, a housing is moulded around each set of terminals, switching means are installed in each housing and each set of terminals is thereafter separated from the strip. In this method the necessary moulding and installing operations are confined to a single production track defined by the single row of sets in the strip.

[0005] A method for producing push button switches is known from US Patent No. 4,803,316 in which two parallel rows of sets of terminals are punched out of a strip, and a housing frame is moulded on each set whereafter the sets are separated from the strip and processed individually for installing the switching means. In this method the individual processing of each discrete set of terminals with attached housing frame requires a number of additional handling steps for insertion in, guidance through, removal from and transportation between the various work stations corresponding to the subsequent steps of installing the switching means in each individual and discrete housing frame.

[0006] So as to be able to form the sets, attach the housings to the sets, install the switching means in the housings and finally separate the sets from the sheet all in more than one production track while the sets still are interconnected in the sheet, the method according to the invention comprises:

- providing a substantially planar sheet of the base metal of said terminals,
- removing portions of the sheet so as to form within the boundaries thereof a plurality of said sets of metallic terminals and so that each terminal remains attached to the sheet solely at the end of the exterior portion of each terminal farthest from the interior portion thereof,

- attaching a housing to each of the sets in the sheet,
- installing a switching means in each of the housings, and
- separating said end of each of the exterior portions of each set provided with a housing and a switching means from the sheet, the at least two rows of said sets of metallic terminals being formed within the boundaries of the sheet of the step of removing portions of the sheet.

[0007] Preferably, a housing is attached to each of one or more sets in each of all the rows substantially simultaneously, and a switching means is subsequently installed in each of the housings in one or more steps, each of said steps being performed in one or more housings of each of all the rows substantially simultaneously.

[0008] When the housings consist of a mouldable plastic material, the housings are preferably attached to each set by being moulded around the metallic terminals of the set.

[0009] So as to utilize the material of the sheet of base metal as efficiently as possible, the sets are preferably disposed in the sheet in an array constituted by substantially parallel, rectilinear rows of sets extending in a first direction and by further substantially parallel, rectilinear rows of sets extending in a second direction substantially at right angles to the first direction.

[0010] Preferably, apertures for guiding and positioning the sheet during the steps of attaching the housing, installing the switching means and separating the sets from the sheet are provided along the edges of the sheet and in at least some of the regions between the sets.

[0011] In cases where the same switch can be used for two or more applications it is advantageous that the same production method and equipment can be used for manufacturing the switch for all such applications and therefore according to the invention each set of terminals may comprise at least two sub-sets, each sub-set corresponding to a different application of the switch, the method comprising a further step in which at least a portion adjacent said end of the exterior portion of each of the terminals of the sub-set or sub-sets of each set not relevant for the current application of the switch is separated from the rest of the terminal and thereby from the completed switch.

[0012] The method of production according to the invention can advantageously be used for a variety of different switches such as rotary switches, toggle switches, on-off switches etc. The method is particularly advantageous in connection with keyboard switches. A currently very utilized keyboard switch is square and has outer dimensions of 6 mm by 6 mm, and the free ends of the terminals of such a switch correspond to the connection points of printed circuit boards designed for such switches. To create more room for other components connected to the printed circuit board it is advantageous that the keyboard switch has smaller dimensions, for instance 4 mm by 4 mm. To enable this smaller switch to

be used both with printed circuit boards designed for the larger switches and with printed circuit boards designed for the smaller ones, the housing of the keyboard switch has, according to the invention, a square section in a plane parallel to the plane of the sheet, the exterior dimensions of the square section being 4 mm wide and 4 mm long, and the set of terminals comprising a first sub-set corresponding to an application, for example exterior printed circuit board electrical connections, of a keyboard switch with a square section with exterior dimensions of 6 mm by 6 mm, and a second sub-set corresponding to an application, for example exterior printed circuit board circuit connections, of a keyboard switch with a square section with exterior dimensions of 4 mm by 4 mm.

[0013] To further reduce production time and thereby increase the throughput with given means as regards personnel, space and production units it is advantageous to reduce the number of separate elements in the switching means, and therefore it is advantageous to apply the method according to the invention to a keyboard switch wherein the switching means of the keyboard switch comprise a contact element for electrically interconnecting at least two of the terminals in a first position of said contact element and interrupting said electrical interconnection in a second position, an activating element for moving the contact element from its second to its first position, a resiliently deformable member arranged for cooperation with the activating element such that it is resiliently deformed when the contact element is in its first position and is undeformed when the contact element is in its second position, and a key element connected to the activating element, said key element being arranged for being operated by a fingertip of a user of the keyboard, the activating element, the deformable member and the key element constituting an integral unit made from a resiliently deformable material such as silicone rubber.

[0014] To further reduce the number of steps to be performed during the installation of the switching means, the contact element, prior to installing the switching means in the housing, is preferably fixedly attached to said unit, for instance by partially embedding it in the material of the unit.

[0015] preferably, the sheet of base metal is substantially rectangular, the rows of sets of terminals being substantially parallel to the sides of the rectangle.

[0016] In some applications it is advantageous that the sheet constitutes a strip that can be wound on and off a roll.

[0017] The invention will be described more in detail in the following with reference to the drawings where:

Figure 1 shows a plan view of an embodiment of a sheet of base metal with sets of terminals and housings of a keyboard switch,

Figure 2 shows an enlarged view of the region of

the sheet in Fig. 1 enclosed in the square indicated by A in Fig. 1,

Figure 3 shows a top view of a completed switch produced by means of the sheet shown in Fig. 1, the outer portions of a first sub-set of terminals being removed,

Figure 4 shows a side elevational view of the switch shown in Fig. 3,

Figure 5 shows a second side elevational view of the switch shown in Figs. 3 and 4,

Figure 6 shows a top view of a completed switch produced by means of the sheet shown in Fig. 1, the outer portions of a second sub-set of terminals being removed,

Figure 7 shows a side elevational view of the switch shown in Fig. 6,

Figure 8 shows a second side elevational view of the switch shown in Figs. 6 and 7, and

Figure 9 shows a cross section along line B - B in Fig. 3.

[0018] A substantially planar sheet 1 of an electrically conductive metal such as a tin-bronze coated with silver is subjected to a punching process whereby the configuration shown in Figs. 1 and 2 is formed. An array of sets of terminals generally indicated by the reference number 2 are disposed in two series of mutually orthogonal rows within the boundaries of the sheet defined by narrow strips 3. Transverse strips 4 interconnect the strips 3 extending in the longitudinal direction of the sheet 1 indicated by the arrow D.

[0019] Each of the sets 2 comprise four terminals 5 and four terminals 6, each of the terminals 5 and 6 being at one end thereof attached to a respective transverse strip 4. At their opposite end, the terminals 5 and 6 are connected to each other in pairs and are connected to a respective circular contact nib 7 which in said punching process is formed such that it projects out of the plane of the sheet 1.

[0020] After having been subjected to the punching process the sheet 1 is subjected to an injection moulding process in which an array of fifteen by seven housings 8 of a plastic, electrically insulating material are simultaneously moulded around the terminals 5 and 6 of corresponding sets of same. One such array is shown in Fig. 1.

[0021] The sheet 1 has a length corresponding to a multiple of such arrays and may comprise a small number of such arrays in case it is desirable to work with a plurality of discrete sheets 1 in the various steps of the production process, and the sheet 1 may comprise a

large number of such arrays in case it is desirable to work with a continuous strip that may be wound on a roll for transport between and feeding into the various work stations or extend as a continuous strip between the work stations in which the various production steps are carried out. In all cases the sheet must be advanced to bring a new area thereof into the work station and thereafter the sheet must be fixedly positioned correctly in the work station. Therefore, during the said punching process, apertures 9 and 10 are punched in the longitudinal strips 3 and the transverse strips 4, respectively, the apertures 9 serving primarily to advance the sheet and the apertures 10 serving to position it.

[0022] After the housings 8 have been moulded around or unto the sets 2 of terminals 5 and 6 the arrays are moved to a switching means installation work station either by transporting discrete sheets 1 individually or in stacks to said work station or by feeding a continuous sheet 1 into the work station from the moulding station or via an intermediate roll on which the continuous sheet 1 is wound.

[0023] In the said work station, fifteen moulded unitary push button snap activating elements 11 are inserted substantially simultaneously in fifteen corresponding housings each from a different longitudinal row in the sheet 1 but not necessarily in the same transverse row. The activating element 11 consists of a resiliently deformable material such as silicone rubber. A contact element 12 consisting of a tin-bronze coated with silver is partially embedded in the activating element 11 during the moulding thereof. The unitary activating element 11 has an upper portion projecting upwards relative to the housing and intended to serve as a key element to be depressed by the fingertip of a user of the switch. The dome shaped lower region of the activating element 11 allows the contact element to be displaced from its inactive position shown in Fig. 9 to its active position in which it is in contact with both the contact nibs 7 when downward pressure is applied to the upper region of the activating element 11.

[0024] The dome shape of said lower region entails a snap effect when the downward pressure builds up sufficiently to overcome the dome resistance so that a buckling of the dome shaped lower region of the activating element 11 takes place whereafter the contact element 12 electrically interconnects the two contact nibs 7 immediately after the user has felt the snap effect.

[0025] After the activating element 11 has been installed the sheet is moved to a cover installation work station where a stainless steel cover 13 is arranged on the activating element 11 and is fixed to the housing by means of fastening members 14 that may be rivets, screws or projections of the housing cooperating with corresponding apertures in the cover 13 and the activating element 11, the fastening members 14 securing the activating element 11 relative to the housing 8. This step is also carried out substantially simultaneously on fifteen switches, one from each longitudinal row of the sheet 1.

[0026] In a subsequent terminal separation work station the terminals 5 and 6 are separated from the sheet 1 at points indicated by dotted lines 15 and 16, respectively, thereby separating the completed switches from the sheet 1 and each other. Depending on the application of the switch, i.e. whether the application corresponds to utilization of the terminals 5 (Figs. 3 - 5) or the terminals 6 (Figs. 6 - 8), the outer portion of the terminals 6 or 5, respectively, are separated from the switch at points indicated by dotted lines 26 and 25, respectively.

[0027] The terminals 5 or 6 may be bent to the required shape as shown in Figs. 3 - 8 in a bending work station included in the terminal separation work station such that the terminals not relevant for the application in question are not separated from the sheet 1 until after the relevant terminals have been separated from the sheet 1 and have been bent into the correct shape in the bending work station.

[0028] These final steps are each also carried out substantially simultaneously on fifteen switches one each from each longitudinal row.

[0029] Naturally, a different number of simultaneously processed switches can be chosen for the different manufacturing steps depending on the methods chosen for performing the activities comprised by the steps.

Example

[0030] The sheet 1 consists of silver plated tin-bronze with a thickness of 0.35 mm. The outer portions of the terminals 5 and 6 are 0.6 mm wide and the distance from the bottom of the housing 8 to the ends of the terminals 5 and 6 in Figs. 4 and 7, respectively, is 3.6 mm while the distance between said ends in the same Figures is 4.5 mm. The distance between said ends of the terminals 5 in Fig. 5 is 6.5 mm while the distance between the ends of the terminals 6 in Fig. 8 is 2.55 mm. The total height of the switch from the bottom of the housing 8 to the top of the activating element 11 is 4.3 mm. The diameter of the top of the activating element 11 is 2 mm. The contact element 12 consists of silver plated tin-bronze and the distance from its lowest portion in Fig. 9 to the top of the contact nibs 7 is 0.7 mm. The activating element 11 consists of silicone rubber. The housing consists of PPS and has outer dimensions of 4 mm by 4 mm in Figs. 3 and 6.

[0031] The method according to the invention can be employed for a variety of other types of switches such as rotary switches, toggle switches, on-off switches etc. where a housing is attached to a set of terminals and switching means are installed in and/or on the housing. The method can also be employed in a variety of cases where the same basic switch has different applications requiring different geometrical configurations of the terminals, different widths and thereby electrical resistances and so on. The number of sub-sets and thereby different applications may be more than two. It would be

obvious to those skilled in the art how to apply the principles of the invention to a series of technical problems of this type.

[0032] Similar observations are valid with respect to a variety of different types of switches such as rotary switches, toggle switches, on-off switches etc. Such switches can also be employed in a variety of cases where the same basic switch has different applications requiring different geometrical configurations of the terminals, different widths and thereby electrical resistances and so on. The amount of sub-sets and thereby different applications may be more than two.

[0033] The method according to the invention is the more advantageous the more different manufacturing steps are to be performed when producing a particular switch.

[0034] Although the keyboard switch housing described with reference to the drawings has a square cross section in a plane parallel to the plane of the sheet, the same principles of the invention will apply to such a switch with any other suitable cross section shape, for instance circular, rectangular and so on. Naturally, said keyboard switch or other switches having multiple uses may also be manufactured in processes utilizing per se known methods, for instance one switch at a time or one row of switches from a narrow strip of conductive material.

Claims

1. A method of producing an electrical switch comprising a housing (8) at least partially enclosing switching means (11,12) for cooperating with a set of at least two metallic terminals (5,6), each terminal having an exterior portion outside the housing (8) and an interior portion inside the housing (8), the method comprising:
 - providing a substantially planar sheet (1) of the base metal of said terminals (5,6),
 - removing portions of the sheet (1) so as to form within the boundaries thereof a plurality of said sets of metallic terminals (5,6) and so that each terminal remains attached to the sheet (1) solely at the end of the exterior portion of each terminal farthest from the interior portion thereof,
 - attaching a housing (8) to each of the sets in the sheet (1),
 - installing a switching means (11,12) in each of the housings, and
 - separating said end of each of the exterior portions of each set provided with a housing (8) and a switching means from the sheet, characterized in that at least two rows of said sets of metallic terminals (5,6) are formed within the boundaries of the sheet (1) at the step of removing portions of the sheet.
2. A method according to claim 1, wherein a housing (8) is attached to each of one or more sets (5,6) in each of all the rows substantially simultaneously, and a switching means (11,12) is subsequently installed in each of the housings (8) in one or more steps, each of said steps being performed in one or more housings of each of all the rows substantially simultaneously.
3. A method according to claim 1 or 2, wherein the housings (8) are attached to each set by being moulded around the metallic terminals (5,6) of the set.
4. A method according to any of claims 1-3, wherein the sets are disposed in the sheet (1) in an array constituted by substantially parallel, rectilinear rows of sets extending in a first direction and by further substantially parallel, rectilinear rows of sets extending in a second direction substantially at right angles to the first direction.
5. A method according to any of the preceding claims, wherein apertures (9,10) for guiding and positioning the sheet during the steps of attaching the housing (8), installing the switching means (11,12) and separating the sets from the sheet are provided along the edges of the sheet and in at least some of the regions between the sets.
6. A method according to any of the preceding claims, wherein each set of terminals (5,6) comprises at least two sub-sets, each sub-set corresponding to a different application of the switch, the method comprising a further step in which at least a portion adjacent said end of the exterior portion of each of the terminals (5,6) of the sub-set or sub-sets of each set not relevant for the current application of the switch is separated from the rest of the terminal and thereby from the completed switch.
7. A method according to any of the preceding claims, wherein the switch is a keyboard switch.
8. A method according to claim 6 or 7, wherein the different applications of the switch consist in different spacings between the electrical connection points of said ends of the exterior portions of the terminals (5,6) of the individual sub-sets to exterior electrical circuitry.
9. A method according to claim 7 and 8, wherein the housing (8) of the keyboard switch has a square section in a plane parallel to the plane of the sheet, the exterior dimensions of the square section being 4 mm wide and 4 mm long and wherein the set of terminals comprises a first sub-set corresponding to an application, for example exterior printed circuit

board electrical connections, of a keyboard switch with a square section with exterior dimensions of 6 mm by 6 mm, and a second sub-set corresponding to an application, for example exterior printed circuit board electrical connections, of a keyboard switch with a square section with exterior dimensions of 4 mm by 4 mm.

10. A method according to claim 8 or 9, wherein the switching means (11,12) of the keyboard switch comprise a contact element (12) for electrically interconnecting at least two of the terminals (5,6) in a first position of said contact element and interrupting said electrical interconnection in a second position, an activating element (11) for moving the contact element from its second to its first position, a resiliently deformable member (12) arranged for co-operation with the activating element (11) such that it is resiliently deformed when the contact element (12) is in its first position and is undeformed when the contact element (12) is in its second position and a key element (11), said key element being arranged for being operated by a fingertip of a user of the keyboard, the activating element (11), the deformable member (12) and the key element (11) constituting an integral unit made from a resiliently deformable material such as silicone rubber.

11. A method according to claim 10, wherein the contact element (12), prior to installing the switching means (11,12) in the housing, is fixedly attached to or integral with said unit, for instance by partially embedding it in the material of the unit.

12. A method according to any of claims 4 - 11, wherein the sheet (1) of base metal is substantially rectangular, the rows of sets of terminals being substantially parallel to the sides of the rectangle.

13. A method according to any of the preceding claims, wherein the sheet (1) constitutes a strip that can be wound on and off a roll.

Patentansprüche

1. Verfahren zur Herstellung eines elektrischen Schalters, der ein Gehäuse (8) umfaßt, das wenigstens teilweise Schaltmittel (11, 12) umschließt zum Zusammenwirken mit einem Satz von wenigstens zwei metallischen Anschlüssen (5, 6), wobei jeder Anschluß einen äußeren Abschnitt außerhalb des Gehäuses (8) und einen inneren Abschnitt innerhalb des Gehäuses (8) aufweist und das Verfahren umfaßt:

- Bereitstellen eines im wesentlichen ebenen

Bogens (1) aus dem Grundmetall der Anschlüsse (5, 6),

- Entfernen von Bereichen des Bogens (1), so daß innerhalb deren Grenzen mehrere der Sätze an metallischen Anschlüssen (5, 6) ausgebildet werden und daß jeder Anschluß an dem Bogen (1) einzig an dem Ende des äußeren Abschnitts jedes Anschlusses befestigt bleibt, der von seinem inneren Abschnitt am weitesten entfernt ist,
- Anbringen eines Gehäuses (8) an jedem der Sätze in dem Bogen (1),
- Installieren eines Schaltmittels (11, 12) in jedem Gehäuse und
- Trennen des Endes jedes äußeren Abschnitts jedes mit einem Gehäuse (8) und einem Schaltmittel versehenen Satzes von dem Bogen, dadurch gekennzeichnet, daß wenigstens zwei Reihen der Sätze aus metallischen Anschlüssen (5, 6) innerhalb der Grenzen des Bogens (1) beim Schritt des Entferns von Bereichen des Bogens ausgebildet werden.

2. Verfahren nach Anspruch 1, wobei ein Gehäuse (8) im wesentlichen gleichzeitig an jedem der einen oder mehreren Sätze (5, 6) in jeder aller Reihen angebracht ist, und ein Schaltmittel (11, 12) darauffolgend in jedem Gehäuse (8) in einem oder mehreren Schritten installiert ist, wobei jeder der Schritte in einem oder mehreren Gehäusen jeder aller Reihen im wesentlichen gleichzeitig durchgeführt wird.

3. Verfahren nach Anspruch 1 oder 2, wobei die Gehäuse (8) an jedem Satz angebracht sind, indem sie um die metallischen Anschlüsse (5, 6) des Satzes gegossen bzw. geformt sind.

4. Verfahren nach einem der Ansprüche 1-3, wobei die Sätze in dem Bogen (1) in einer Matrix bzw. Anordnung angeordnet sind, die gebildet ist durch im wesentlichen parallele, geradlinige Reihen an Sätzen, die sich in einer ersten Richtung erstrecken und durch desweiteren im wesentlichen parallele, geradlinige Reihen an Sätzen, die sich in einer zweiten Richtung, im wesentlichen unter rechten Winkeln zu der ersten Richtung, erstrecken.

5. Verfahren nach einem der vorstehenden Ansprüche, wobei entlang der Ränder des Bogens und in wenigstens einigen Bereichen zwischen den Sätzen Öffnungen (9, 10) zum Führen und Positionieren des Bogens während der Schritte des Befestigens des Gehäuses (8), des Installierens der Schaltmittel (11, 12) und des Trennens der Sätze

von dem Bogen, vorgesehen sind.

6. Verfahren nach einem der vorstehenden Ansprüche, wobei jeder Satz Anschlüsse (5, 6) wenigstens zwei Untersätze umfaßt, wobei jeder Untersatz einer unterschiedlichen Anwendung des Schalters entspricht, wobei das Verfahren einen weiteren Schritt umfaßt, bei dem zumindest ein Abschnitt, der an dem Ende des äußeren Abschnitts jedes Anschlusses (5, 6) des Untersatzes angrenzt oder Untersätze jedes Satzes, der für die gegenwärtige Anwendung des Schalters nicht relevant ist, von dem Rest des Anschlusses getrennt wird und dabei von dem fertigen Schalter.

7. Verfahren nach einem der vorstehenden Ansprüche, wobei der Schalter ein Tastschalter ist.

8. Verfahren nach Anspruch 6 oder 7, wobei die unterschiedlichen Anwendungen des Schalters aus unterschiedlichen Abständen bestehen zwischen den elektrischen Anschlußpunkten der Enden der äußeren Abschnitte der Anschlüsse (5, 6) der individuellen Untersätze und der äußeren elektrischen Schaltungsanordnung.

9. Verfahren nach Anspruch 7 und 8, wobei das Gehäuse (8) des Tastschalters einen rechteckigen Querschnitt in einer Ebene parallel zur Ebene des Bogens hat, wobei die Außenabmessungen des rechteckigen Querschnitts sich auf 4 mm in der Breite und 4 mm in der Länge belaufen und wobei der Satz Anschlüsse einen ersten Untersatz umfaßt, der einer Anwendung entspricht, beispielsweise für äußere elektrische Verbindungen einer bedruckten Leiterplatte, eines Tastschalters mit einem Rechtecksquerschnitt mit Außenabmessungen von 6 mm auf 6 mm, und einem zweiten Untersatz umfaßt, der einer Anwendung entspricht, beispielsweise für äußere elektrische Verbindungen bedruckter Leiterplatten eines Tastschalters mit einem rechteckigen Querschnitt mit Außenabmessungen von 4 mm auf 4 mm.

10. Verfahren nach Anspruch 8 oder 9, wobei die Schaltmittel (11, 12) des Tastschalters ein Kontaktelement (12) umfassen, zum elektrischen Verbinden wenigstens zweier Anschlüsse (5, 6) in einer ersten Position des Kontaktelementes und zum Unterbrechen der elektrischen Verbindung in einer zweiten Position, ein Aktivierelement (11) zum Bewegen des Kontaktelementes aus seiner zweiten Position in seine erste Position, ein elastisch deformierbares Element (12), das zum Zusammenwirken mit dem Aktivierelement (11) derart angeordnet ist, daß es elastisch deformiert wird, wenn das Kontaktelement (12) in seiner ersten Position ist und undeformiert ist, wenn das Kontaktelement (12) in sei-

ner zweiten Position ist, und ein Tastenelement (11), das mit dem Aktivierelement (11) verbunden ist, wobei das Tastenelement derart angeordnet ist, daß es durch die Fingerspitze eines Benutzers der Tastatur betätigbar ist, wobei das Aktivierelement (11), das deformierbare Element (12) und das Tastenelement (11) eine integrale Einheit aus einem elastisch deformierbaren Material, wie beispielsweise Silikon-Kautschuk, bilden.

11. Verfahren nach Anspruch 10, wobei das Kontaktelement (12) vor dem Installieren des Schaltmittels (11, 12) in dem Gehäuse ortsfest angebracht wird oder integral ausgebildet ist mit der Einheit, beispielsweise indem es teilweise in dem Material der Einheit eingebettet wird.

12. Verfahren nach einem der Ansprüche 4-11, wobei der Bogen (1) aus Grundmetall im wesentlichen rechteckig ist, wobei die Reihen an Sätzen von Anschlüssen im wesentlichen parallel zu den Seiten des Rechtecks sind.

13. Verfahren nach einem der vorstehenden Ansprüche, wobei der Bogen (1) einen Streifen bildet, der auf eine Rolle auf- und von einer Rolle abgewickelt werden kann.

Revendications

1. Procédé de production d'un interrupteur électrique comprenant un boîtier (8) renfermant au moins partiellement des moyens de commutation (11, 12) pour fonctionner en association avec un ensemble d'au moins deux bornes métalliques (5, 6), chaque borne ayant une partie extérieure à l'extérieur du boîtier (8) et une partie intérieure à l'intérieur du boîtier (8), le procédé comprenant les étapes consistant :

- à fournir une feuille (1) pratiquement plane du métal de base desdites bornes (5, 6),
- à enlever des parties de la feuille (1) de façon à former, à l'intérieur de ses limites, une pluralité desdits ensembles de bornes métalliques (5, 6) et de façon telle que chaque borne reste fixée sur la feuille (1) seulement au niveau de l'extrémité de la partie extérieure de chaque borne la plus éloignée de sa partie intérieure,
- à fixer un boîtier (8) sur chacun des ensembles de la feuille (1),
- à installer des moyens de commutation (11, 12) dans chacun des boîtiers, et
- à séparer, de la feuille, ladite extrémité de chacune des parties extérieures de chaque ensemble doté d'un boîtier (8) et de moyens de commutation,

caractérisé en ce que au moins deux rangées desdits ensembles de bornes métalliques (5, 6) sont formées à l'intérieur des limites de la feuille (1) lors de l'étape d'enlèvement de parties de la feuille.

2. Procédé selon la revendication 1, dans lequel un boîtier (8) est fixé, pratiquement simultanément, sur chaque ensemble ou sur chacun des ensembles (5, 6) dans toutes les rangées, et dans lequel un moyen de commutation (11, 12) est ensuite installé dans chacun des boîtiers (8) suivant une ou plusieurs étapes, chacune desdites étapes étant réalisée pratiquement simultanément dans un ou plusieurs des boîtiers de toutes les rangées.
3. Procédé selon la revendication 1 ou 2, dans lequel les boîtiers (8) sont fixés sur chaque ensemble en étant moulés autour des bornes métalliques (5, 6) de l'ensemble.
4. Procédé selon l'une quelconque des revendications 1 à 3, dans lequel les ensembles sont disposés dans la feuille (1) suivant un agencement constitué par des rangées rectilignes pratiquement parallèles d'ensembles s'étendant dans une première direction et constitué par d'autres rangées rectilignes pratiquement parallèles d'ensembles s'étendant dans une seconde direction pratiquement à angles droits par rapport à la première direction.
5. Procédé selon l'une quelconque des revendications précédentes, dans lequel des ouvertures (9, 10) sont prévues le long des bords de la feuille et dans au moins certaines zones entre les ensembles, ces ouvertures servant à guider et à positionner la feuille au cours des phases consistant à fixer le boîtier (8), à installer les moyens de commutation (11, 12) et à séparer les ensembles de la feuille.
6. Procédé selon l'une quelconque des revendications précédentes, dans lequel chaque ensemble de bornes (5, 6) comprend au moins deux sous-ensembles, chaque sous-ensemble correspondant à une application différente de l'interrupteur, le procédé comprenant une autre étape au cours de laquelle au moins une partie adjacente à ladite extrémité de la partie extérieure de chacune des bornes (5, 6) du sous-ensemble ou des sous-ensembles de chaque ensemble, non utile pour l'application en cours de l'interrupteur, est séparée du reste de la borne et donc de l'interrupteur complété.
7. Procédé selon l'une quelconque des revendications précédentes, dans lequel l'interrupteur est un interrupteur de clavier.
8. Procédé selon la revendication 6 ou 7, dans lequel les différentes applications de l'interrupteur consis-

tent en différents espacements entre les points de connexion électrique desdites extrémités des parties extérieures des bornes (5, 6) des sous-ensembles individuels, à des circuits électriques extérieurs.

9. Procédé selon les revendications 7 et 8, dans lequel le boîtier (8) de l'interrupteur de clavier a une section carrée dans un plan parallèle au plan de la feuille, les dimensions extérieures de la section carrée étant de 4 mm de large et de 4 mm de long, et dans lequel l'ensemble de bornes comprend un premier sous-ensemble correspondant à une application - par exemple des connexions électriques de cartes de circuits imprimés extérieurs - d'un interrupteur de clavier à section carrée dont les dimensions extérieures sont de 6 mm par 6 mm, et un second sous-ensemble correspondant à une application - par exemple des connexions électriques de cartes de circuits imprimés extérieurs - d'un interrupteur de clavier à section carrée dont les dimensions extérieures sont de 4 mm par 4 mm.
10. Procédé selon la revendication 8 ou 9, dans lequel les moyens de commutation (11, 12) de l'interrupteur de clavier comprennent un élément de contact (12) pour interconnecter électriquement au moins deux des bornes (5, 6) dans une première position dudit élément de contact et pour interrompre ladite interconnexion électrique dans une seconde position, un élément (11) d'activation pour déplacer l'élément de contact passant de sa seconde à sa première position, un élément (12) élastiquement déformable disposé pour coopérer avec l'élément (11) d'activation de façon telle qu'il est élastiquement déformé lorsque l'élément de contact (12) est dans sa première position et qu'il est non déformé lorsque l'élément de contact (12) est dans sa seconde position, et un élément (11) à touche connecté à l'élément (11) d'activation, ledit élément à touche étant configuré pour être actionné par la pointe du doigt d'un utilisateur du clavier, l'élément (11) d'activation, l'élément déformable (12) et l'élément (11) à touche constituant un ensemble unitaire intégré fabriqué dans une matière élastiquement déformable telle que du caoutchouc de silicone.
11. Procédé selon la revendication 10, dans lequel l'élément (12), avant l'installation des moyens de commutation (11, 12) dans le boîtier, est solidement fixé sur ledit ensemble unitaire ou est solidaire de cet ensemble, par exemple en enrobant partiellement cet élément de contact dans la matière de l'ensemble unitaire.
12. Procédé selon l'une quelconque des revendications 4 à 11, dans lequel la feuille (1) du métal de base est pratiquement rectangulaire, les rangées d'en-

sembles de bornes étant pratiquement parallèles aux côtés du rectangle.

13. Procédé selon l'une quelconque des revendications précédentes, dans lequel la feuille (1) constitue une bande sur rouleau pouvant être enroulée et déroulée.

5

10

15

20

25

30

35

40

45

50

55

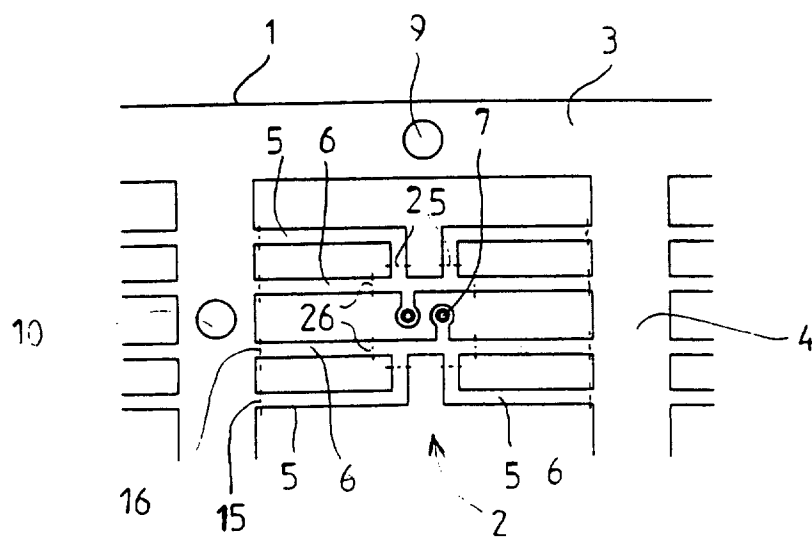
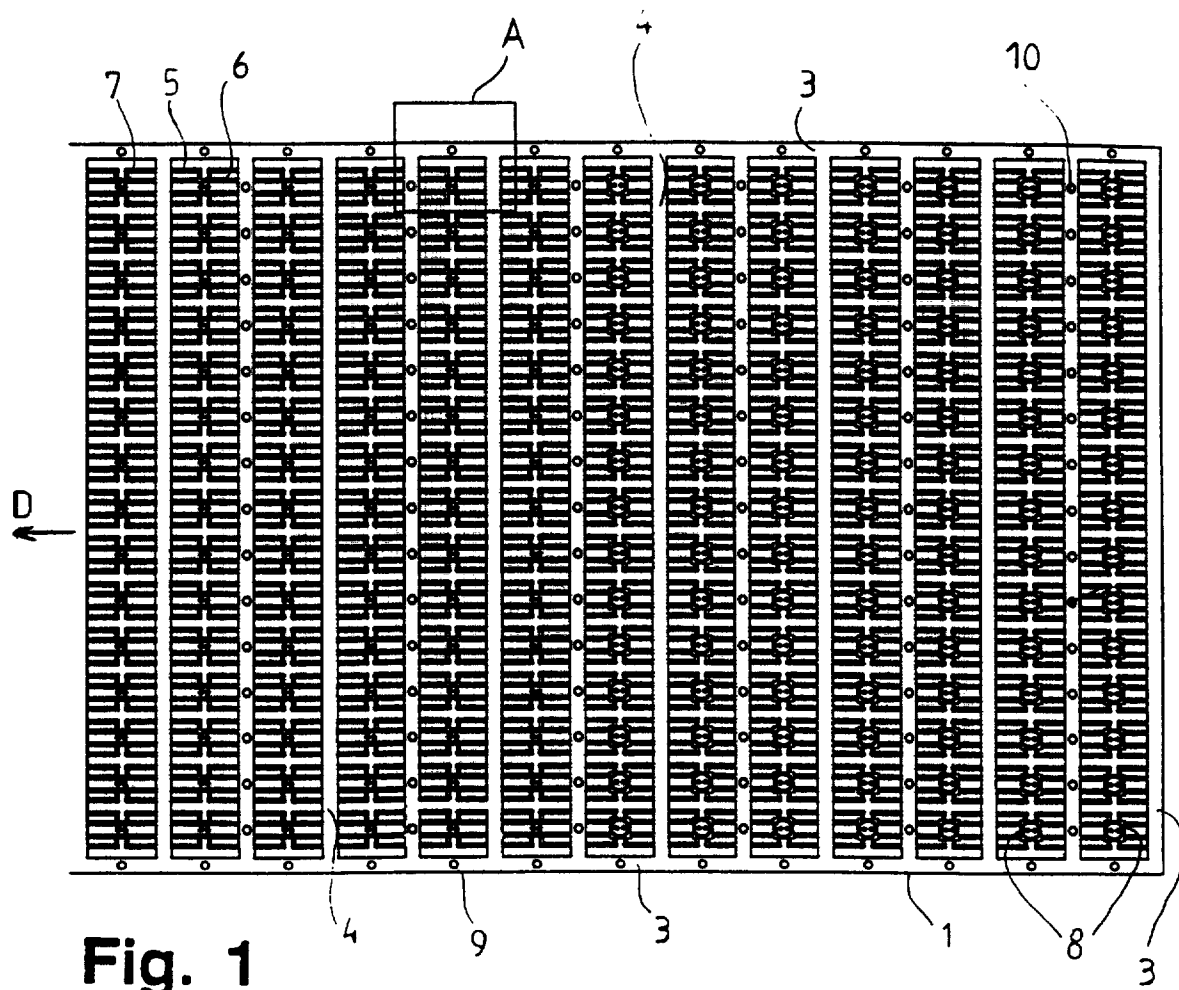


Fig. 2

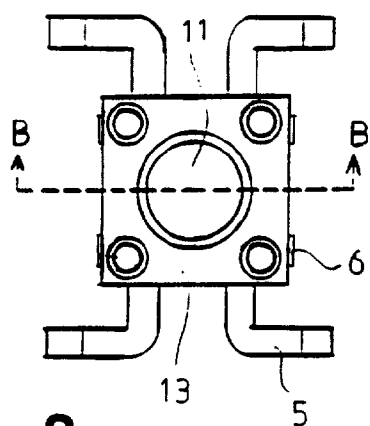


Fig. 3

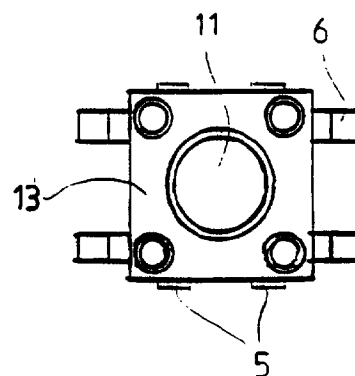


Fig. 6

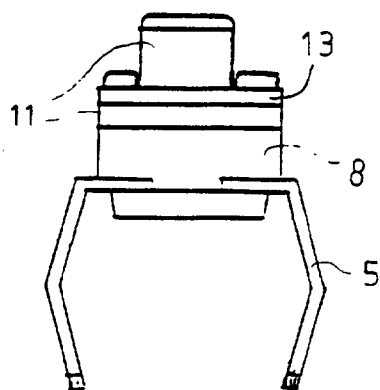


Fig. 4

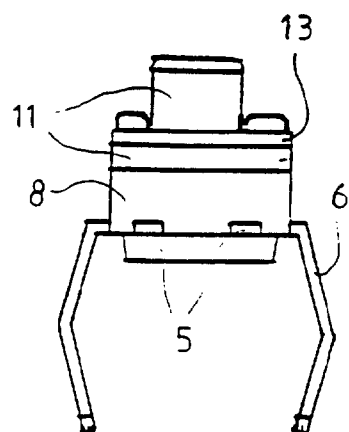


Fig. 7

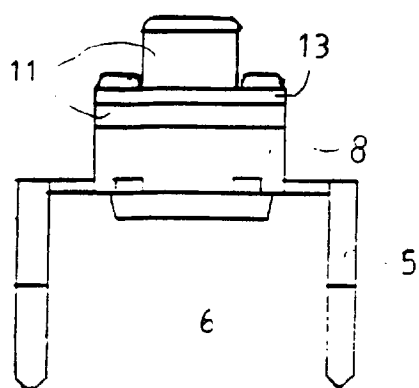


Fig. 5

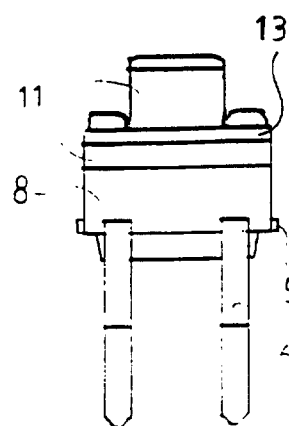


Fig. 8

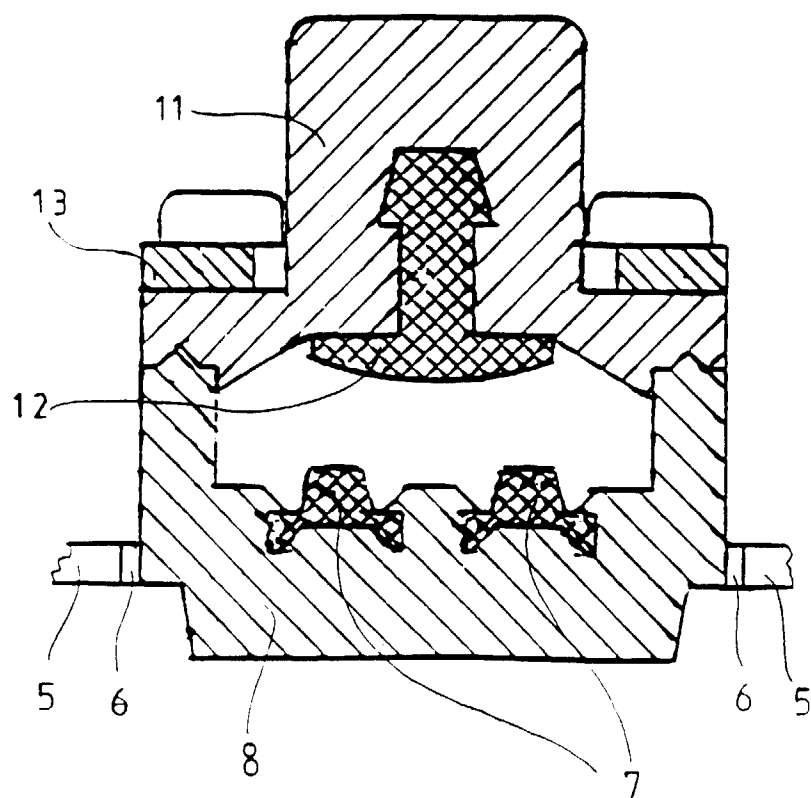


Fig. 9